Oct. 18, 1949. F. JANE 2,485,289

APPARATUS FOR PRINTING ON FABRICS, PAPER OR THE LIKE

Filed Sept. 10, 1946 2 Sheets-Sheet 1

FIG. 1.

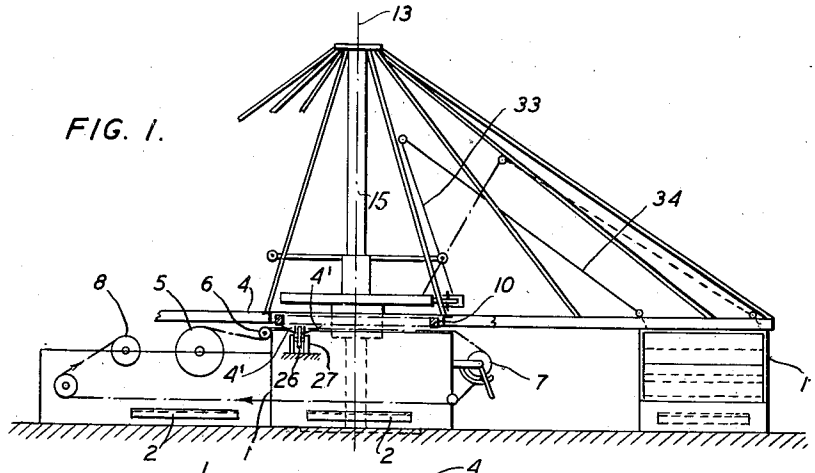
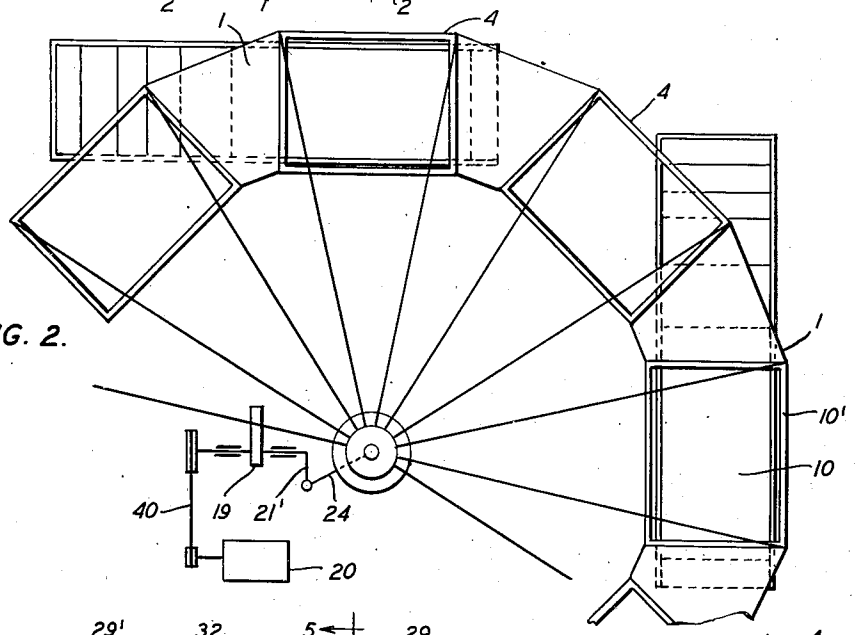


FIG. 2.



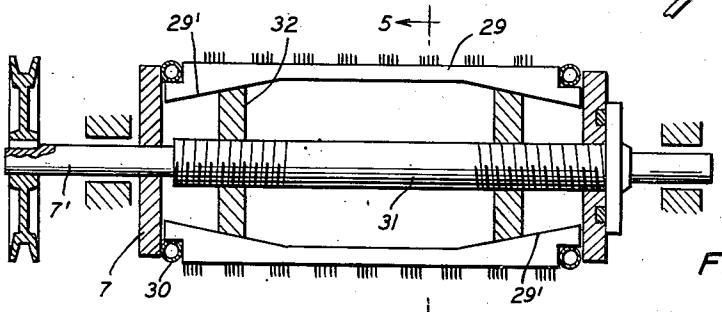


FIG. 4.

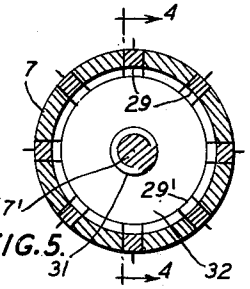


FIG. 5.

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FIG. 3.

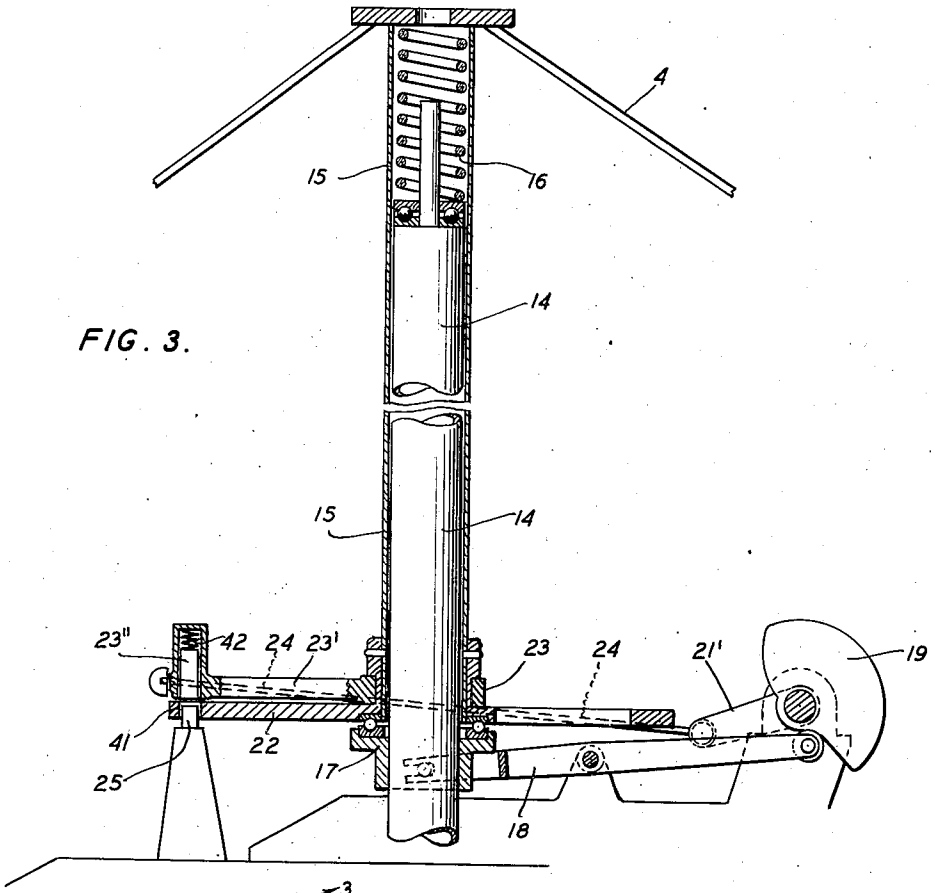
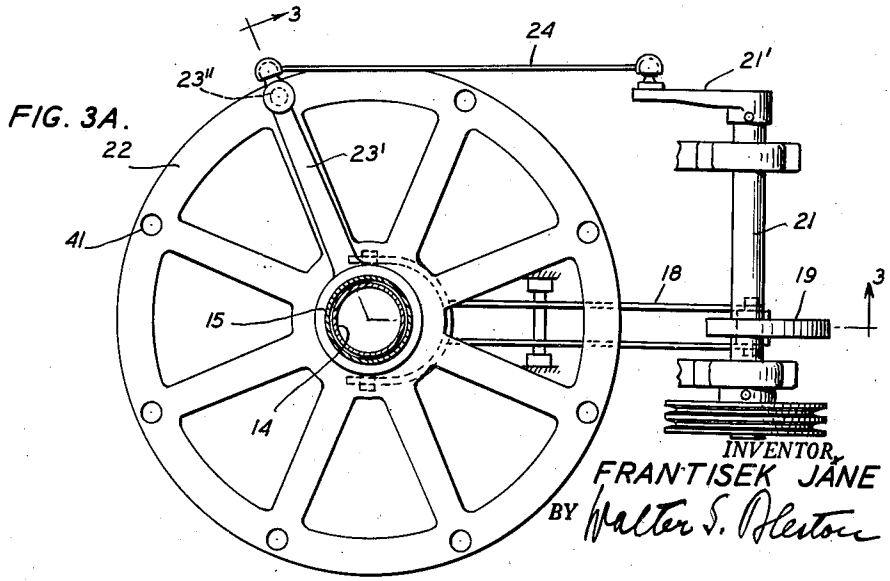


FIG. 3A.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR PRINTING ON FABRICS, PAPER, OR THE LIKE

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13 Claims. (Cl. 101—115)

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The invention relates to apparatus for the printing on fabrics, paper or similar material in bands with the aid of screen stencils. Such printing is conventionally done on long tables on which the fabric or paper has been fixed by any convenient method, the printing stencil being moved intermittently along the table in such a way as to print consecutively a continuous pattern. In the conventional apparatus the printing stencil is shifted either manually or on a carriage and, by a suitable mechanism, lowered on the predetermined places whereas the printing paste is transmitted to the fabric with the aid of film stencils by a manually or automatically controlled scraper or squeegee.

This method of printing is disadvantageous as the glueing or otherwise fixing of the fabric on the working tables is a troublesome job and as difficulties are encountered especially when printing with a plurality of colours, where it is necessary to use successively a number of stencils. The high initial costs of the whole apparatus and the need of a space of a large area are additional drawbacks.

The apparatus according to the invention aims to avoid such disadvantages and drawbacks by the provision of a table on which the fabric is stretched by using guiding and/or driving rollers, wherein the dimensions of the tables do not need to depart much from the dimensions of a printing stencil. Printing stencils are arranged about an axis in such a manner that each of them after having completed its print can be raised and turned to the side so as to permit a differently colored stencil to print on the same base.

It is further possible to place around the turning axis of the printing stencils a number of tables and on every one of them to print in succession with the same set of printing stencils. After finished printing with all colours and shifting of the fabric, the operation may be repeated for the following part of the fabric.

An embodiment of the invention is shown, by way of example, in the accompanying drawing, wherein

Figs. 1 and 2 are diagrammatic side elevation and top plan views, respectively, of an apparatus according to the invention;

Fig. 3 is a sectional view of the drive of the apparatus, along line 3—3 of Fig. 3A which is a top plan view thereof.

Fig. 4 is a cross-section of a driving roller, and Fig. 5 is a section along line 4—4 in Fig. 5.

The fabric to be printed is wound off the bolt 5 over a guiding roller 6 and is stretched on the table

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1 with the aid of the driving roller 7 that catches the fabric all over its width with the aid of pins or other means and causes periodically its movement for a certain predetermined length. The fabric is further led from the driving roller underneath the table 1 over a drying arrangement 2 to the roller 8 on which it is wound. This roller is driven in dependance on the driving roller 7 over a friction coupling (not shown) to compensate the different diameter of the roller 8 during the gradual winding on of the fabric. Thus a certain length of the fabric will be stretched on table 1, ready for printing.

A frame 4 provided with holders 10' for printing stencils 10 (Figs. 1 and 2) is rotatable or turnable about the axis 13 in such a way as to enable any stencil to come progressively over the table 1 for printing. The stencils may be advantageously of the so called film type, i. e. a dense wire mesh stretched in a frame of suitable dimensions on which the required pattern is formed by a photographic process so that the printing paste may be squeezed through the mesh on the fabric. Thus it is possible to arrange in the frame 4 a number of stencils for different colours and progressively make the impressions on the table 1, then to move the fabric the required length and continue the printing.

The rotatable frame 4 is fixed for instance on a pipe 15 (see Figs. 1 and 3) that is slidable on a pole 14 in relation to which it may be turned and axially displaced. On the end of the pole 14 a recess is arranged that forms a space in which a strong spring 16 and a ball or roller bearing are fitted. The spring 16 serves to lessen the force required to raise the frame.

The raising of the pipe 15 with the frame 4 is accomplished with the aid of the sleeve 17 on which a two armed lever 18 is acting that is controlled by a cam wheel 19 on the shaft 21, driven by the electric motor 20 over a gear shown schematically as a belt drive 40.

The periodic turning of the frame 4 is also accomplished in dependence on the rotation of the shaft 21. For this purpose, a disc 22 is secured to the pipe 15 and provided with a number of recesses or holes 41 according to the number of stencils for which the frame is destined. These holes are spaced equally from one another and also equally from the disc axis. Coaxially with, but free to turn in relation to the disc, a sleeve 23 is arranged which has a radial arm 23' fixed thereto. This arm can be reciprocated about the disc axis by means of a crank 21' on shaft 21 and a connecting rod 24. The length of the arm 23'

and the dimensions of its crank drive are so selected that the angle through which the arm 23' can be reciprocated is equal to the angular spacing of the holes of the disc. Arm 23' carries a bolt 23'' pressed down by a spring 42 and adapted to engage the holes 41, one at a time, of the disc 22. A stationary bolt 25 is provided at the same radial distance from the axis as bolt 23'' but on the other side of the disc. Thus, the sleeve 23 with arm 23' and spring-biased bolt 23'' in cooperation with the holes-provided disc 22 constitutes a kind of pawl and ratchet drive, bolt 25 serving to release bolt 23'' from engagement as described hereinafter.

In Fig. 3 rotation of shaft 21 with crank 21' has shifted arm 23' into its first end position in which bolt 23'' is in registry with the stationary bolt 25, and the cam drive 17, 18, 19 acting on pipe 15 has lowered the latter and with it disc 22 so far that bolt 25 engages one of the holes therein, and the end of bolt 23'' bearing on bolt 25 is above the top surface of the disc 22. During the following turning of the shaft 21 for about 180°, the printing is done while crank 21' turns arm 23' from its first into its second end position with bolt 23'' sliding on the top of disc 22. At the end of this stroke the bolt 23'' will be in registry with the subsequent hole and drop into it thereby coupling the crank drive with the disc 22 and the whole frame. Simultaneously, the follower lever 18 reaches the ascending part of cam 19 and causes the frame to be lifted. On its return stroke caused by the crank drive, arm 23' is coupled to the frame 4 owing to the engagement of bolt 23'' in the mentioned subsequent disc hole, as stated hereinbefore. In consequence, the frame with the stencils and disc will follow the angular movement of arm 23'. Shortly before the arm 23' reaches again its first end position, the cam drive will start to lower the frame 4, so that when the first end position is reached bolt 25, now in registry with bolt 23'' and with the hole the latter occupies, will enter that hole, thereby pushing bolt 23'' out of that hole and simultaneously ensuring the correct position of a stencil in relation to the printing table and the fabric thereon. Thus, the apparatus is again in a position according to Fig. 3 and the operation may be repeated as described by continued rotation of shaft 21.

To secure an exact position of the frame in respect to the printing table a further catch is arranged for instance in the form of a bolt 26 (see Fig. 1) pushed out of an electromagnetic coil 27 by a spring. The frame 4 has extensions 4' with an inclined rim between which enters the bolt 26 that is fixed on the stationary table 1 and pushed up by the action of the spring. During the following lowering of the frame 4 into the printing position the spring and the bolt 26 are somewhat pushed into the magnetic coil. As soon as the printing is finished and the frame 4 is raised, the magnetic coil 27 is energized, so as to keep the catch bolt 26 in its lower position and to allow thus the turning of the frame 4. The energizing of the magnetic coil may be for instance controlled by the position of the bolt 23'', that causes the turning of the disc 22 and the frame 4. As soon as the bolt 23'' enters the hole in the disc 22, the electric circuit for the magnetic coil 27 may be completed and again interrupted when the frame 4 has been turned the respective angle.

The printing in several colours may be performed in the following way: The fabric will be prepared, stretched on the table 1 and the printing stencils with the required supply of the respective printing pastes will be fixed in the frame 4. The first printing stencil will be lowered into the printing position, and the paste scraped over it manually or by using a mechanical scraper or squeegee. The printing stencil will then be raised and the frame turned into the position where the following printing stencil is prepared for printing. This operation will be repeated until all required patterns have been printed. Then the driving roller 7 comes into action, so as to move the fabric on the table a length corresponding to the width of the printing stencil 10, whereupon the whole arrangement is ready for printing the following part of the fabric. Thus it is ascertained that the different printing stencils will come to print exactly on the same place as the foregoing ones without requiring the fabric to be fixed in a special way. The operation goes on quickly and economically and the whole apparatus needs only a limited floor space. At the same time it is possible to print simultaneously on several tables. Thus the slow work in connection with the laying and glueing of the fabric on the table and the difficult manipulation with the printing stencils on long tables are not required. This advantage is especially apparent with wide fabrics where the movement of printing stencils of large dimensions over the table is especially troublesome. With the apparatus according to the invention it is possible to shift easily from printing of narrow fabrics to printing of wide fabrics by a simple changing of printing stencils or by limiting the scraping movement.

The described apparatus should be considered as an example of an embodiment of the invention and the detailed arrangement may be very different. So it is possible to provide the frame 4 with a rotatory movement only and lower only the printing stencils. Similarly it is possible to arrange the raising and lowering of the frame or of the printing stencils respectively by hydraulic or other means. To prevent the printed fabric from adhering to the printing stencils a number of holes may be arranged in the table 1 with the aid of which the fabric may be made to stick to the table by suction effect. The scraping of the printing paste may be effected on each table manually or automatically whereby the driving of the automatic scrapers or squeegees may be accomplished centrally from a device in the centre part of the frame 4.

If printing stencils of different width are used, the driving rollers 7 may be either exchangeable or one roller may be used, fitted with axial bars which are provided with a number of pins to engage the fabric and can be simultaneously pushed in or out of slots in the roller 7. An example of such a roller is shown in Figs. 4 and 5. The roller 7 has several slots into which bars 29 are fitted. The bars have, on the outer surface, pins for engaging the fabric and on the inner surface inclined portions 29'. The bars 29 are pushed towards the centre of the roller by a spring 30 on the circumference of the bars or by any other suitable means. A tube 31 having a left and right hand thread on its surface is slid on the shaft 7' and a pair of setting discs 32 adjustable by the tube 31 are leaning against the inclined inner portions 29' of bars 29. By turning the tube 31 in one or the other direction, the bars 29 will be spread by the discs 32 or contracted by spring 30. Thereby an increase or decrease of the active diameter of the driving roller 7 can be

attained. The drive of the driving roller may be controlled either manually by means of a clutch or by a switch or automatically in dependance of the position of frame 4.

To enable the printing stencils to be put in exactly the same positions with regard to the table, every printing stencil or its frame has advantageously three eyelets or extensions cooperating with bolts or other means on the printing table.

For a smaller number of printing stencils, namely for two only it is possible to use a frame that turns a certain angle only, and similarly for a large number of colours, it is possible to arrange in one field of the frame 4 more stencils that may be alternatively brought into the printing position.

If printing with one colour only is required, the frame need not be turned and the raising and lowering device of the frame and/or printing stencils operates only together with the scrapers and the shifting of the fabric.

What I claim and desire to secure by Letters Patent is:

1. An apparatus of the type described comprising a stationary guiding member defining a vertical axis, a frame rotatable and vertically shiftable in relation to said member by which it is guided, said frame including a plurality of holders for printing stencils, said holders being arranged in one horizontal plane and being equally spaced from one another on a circle about said axis, a stationary table adapted to receive thereon material to be printed, said table being of a size substantially according to one of said holders and in a position under said holders to permit them one after the other to register with said table, means to turn said frame intermittently angles equal to the angular spacing of said holders, means to cause intermittently axial reciprocations of said frame from a raised to a lowered and back to the raised position.

2. An apparatus as claimed in claim 1, further comprising means in connection with said guiding member and said frame to balance at least part of the frame weight.

3. An apparatus of the type described comprising a stationary guiding member defining a vertical axis, a frame rotatable and axially shiftable in relation to said member by which it is guided, said frame including a plurality of holders for printing stencils, said holders being arranged in one horizontal plane and being equally spaced from one another on a circle about said axis, a stationary table in a position underneath said holders to permit them one after the other to register with said table, a first driving means for intermittently turning said frame in one direction, angles equal to the angular spacing of two adjacent ones of said holders, a second driving means to cause intermittently axial reciprocations of the frame from a raised to a lowered and back to the raised position, a common means to operate both said driving means, and means to cause one reciprocation of the frame to occur substantially during each intermission between two angular turns of said frame.

4. An apparatus of the type described comprising a stationary guiding member defining a vertical axis, a frame rotatable and axially shiftable in relation to said member by which it is guided, said frame including a plurality of holders for printing stencils, said holders being arranged in one horizontal plane and being equally spaced from one another on a circle about said axis, a

stationary table in a position underneath said holders to permit them one after the other to register with said table, a pawl and ratchet drive to turn said frame intermittently through angles according to the angular spacing of two adjacent ones of said holders, an intermittently operative drive to reciprocate said frame in the axial direction, and common means to operate both said drives in a predetermined timed relation to each other.

5. An apparatus as claimed in claim 4, wherein said drives and said common means include a rotating shaft, a first and a second eccentric member on said shaft, said first eccentric member being operatively connected to said pawl, said second eccentric member being part of said means to reciprocate said frame in the axial direction, said eccentric members being angularly so spaced in relation to each other that a reciprocating movement of the frame from high to low and back to high position occurs substantially during an idling stroke of said pawl.

6. An apparatus as claimed in claim 4, further comprising first means to urge said pawl at the end of its idling stroke into coupling connection with said frame, a second stationary means to disengage said pawl from its connection with said frame at the end of the other stroke of said pawl, and a third stationary means engageable by said frame when lowered from its topmost position to lock said frame against turning.

7. An apparatus as claimed in claim 4, said ratchet being coaxially secured to said frame and provided with as many equally spaced recesses as there are stencil holders in said frame, said pawl being reciprocable about said axis, means to urge said pawl into engagement with one of said recesses with which the pawl is in registry at the end of one of its strokes, a stationary member embodying means to disengage said pawl from said recess at the end of its other stroke, and being adapted to engage said ratchet so as to lock said frame against angular movement when the frame is lowered from its topmost position.

8. An apparatus of the type described comprising a stationary guiding member defining a vertical axis, a frame rotatable and axially shiftable in relation to said member by which it is guided, said frame including a plurality of holders for printing stencils, said holders being arranged in one horizontal plane and being equally spaced from one another on a circle about said axis, a stationary table in a position underneath said holders to permit them one after the other to register with said table, a disc coaxially secured to said frame, said disc being provided with equally spaced holes, as many as there are holders, an arm freely movable on top of said disc and about said axis, a spring-biased pin in connection with said arm and adapted to engage a disc hole when in registry therewith so as to couple said arm to said disc, a drive in connection with said arm to reciprocate it through an angle equal to the spacing of two adjacent disc holes, an intermittently operative drive to reciprocate said frame in axial direction, and a stationary means on the side of the disc opposite said arm, and positioned in registry with said pin when said arm is at the end of one of its strokes, said means being adapted to remove said pin against the restraint of said spring from the disc hole the pin engages and to enter said hole so as to lock said frame against angular movement when the latter with said disc is lowered from its topmost position.

9. An apparatus as claimed in claim 8, wherein said drives and said common means include a rotating shaft, a crank secured to said shaft and operatively connected to said pawl, a cam secured to said shaft, a follower member in engagement with said cam and operatively connected to said frame to reciprocate the latter in axial direction according to the cam form, said crank and said cam being so set in angular relation to each other that one of the dead centers in relation to said pawl occurs shortly after said follower has reached a point of the cam form where the downward movement of said frame starts.

10. An apparatus as claimed in claim 1 further comprising means to stretch a length of a band material on said table, said means including a driving roller adapted to engage said material and to advance it on said table equal lengths intermittently in dependence on the angular position of said frame.

11. An apparatus as claimed in claim 10, said roller being of an expansible structure in which the diameter of said roller is variable.

12. An apparatus as claimed in claim 11, said roller comprising a plurality of bars arranged equidistantly from one another and equidistantly from and parallel to an axis, said bars being movable in radial directions, pins secured to said bars and projecting outwardly therefrom for engaging the stock material, and means to change in unison the distances of said bars from said axis.

13. An apparatus as claimed in claim 12, said means comprising an inner rotatable shaft, means to cause said bars to rotate with said inner shaft, a hollow shaft with a right hand and a left hand outer threading rotatable on said inner shaft, internally threaded discs on said shaft threadings respectively, said discs having oppositely tapered peripheral faces, said bars having correspondingly tapered inner faces in engagement with said disc faces, and spring means in engagement with said bars and tending to urge them towards that axis whereby relative rotation of said shafts will cause a change of the radial distance of the bars from the shaft axis.

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